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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 26

Application Number: 09/121,528
Filing Date: July 23, 1998
Appellant(s): DERDERIAN, GARO J.

Thomas D'Amico
For Appellant

EXAMINER'S ANSWER

This is in response to appellant's brief on appeal filed May 29, 2001.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal involves claims 1-4, 6-10, 12-36, and 46-68.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is substantially correct. The changes are as follows: The rejection of claims 1-4, 6-10, 12-36, and 46-68 under 35 USC 103 as being unpatentable over Kwon et al. in view of Baum et al. and Chen et al. is considered to be redundant with the other rejections and is therefore withdrawn in order to simplify the issues for appeal.

(7) Grouping of Claims

The appellant's statement in the brief that certain claims do not stand or fall together is not agreed with because the claims should stand or fall as grouped in the rejections. Appellants

have not provided sufficient reasons in the arguments section of the appeal brief to support their statement of separate patentability. Specifically, appellants have merely argued that subject matter of certain claims is not taught in the prior art but have provided no reasons as to why the subject matter of these claims is separately patentable from the other claims. For instance, appellants argue at page 5 of the appeal brief that time ranges for deposition of 45 seconds to 1000 seconds in claims 57, 62, and 66 and 75 seconds to 150 seconds in claims 58, 63, and 68 are not disclosed or suggested by Baum et al., however, appellants have provided no reasons why claims reciting the narrower range should be separately patentable from claims reciting the broader range.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,783,716	BAUM et al.	7-1998

Kwon et al., "Characterization of Pt Thin Films Deposited by Metallorganic Chemical Vapor Deposition for Ferroelectric Bottom Electrodes", J. Electrochem. Soc. Vol. 144, No. 8 (August, 1987), pp. 2848-2854.

Chen et al., "Low-Temperature Organometallic Chemical Vapor Deposition of Platinum", Appl. Phys. Lett. Vol. 53, No. 17 (October 24, 1988), pp. 1591-1592.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 56-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum et al. (5,783,716).

Baum et al. disclose a process for depositing platinum films comprising providing a precursor such as methylcyclopentadienyl trimethylplatinum (col. 6, line 9) to a chamber containing a substrate, along with an oxidizing gas, such as oxygen and nitrous oxide mixtures, and depositing the platinum film on a substrate at 200-300 °C, said platinum film being useful for an electrode for DRAM (Example 6). The claimed substrates are disclosed at col. 7, lines 52-63.

Baum et al. are silent as to the flow rate at which the oxygen/nitrous oxide gas is delivered to the chamber. However, because this flow rate affects the amount of oxidizing gas mixture provided to the chamber for removal of carbon impurities and would also depend on the amount and type of platinum precursor delivered, deposition rate, etc. which factors determine how much carbon is present, the total flow rate of oxidizing gases to the chamber is a result effective parameter and it would have been a matter of routine experimentation to determine appropriate amounts (flow rates) of the oxidizing gases to provide to optimize removal of carbon from the film.

With respect to claims 61-68, Baum et al. disclose that higher precursor delivery rates are achieved when delivering the precursor by direct liquid injection rather than by using conventional bubbler systems which involve delivering the precursor by bubbling a non-reactive gas therethrough (col. 1, line 65 to col. 2, line 2). However, because Baum et al. disclose at col. 1, lines 40-65 that conventional bubbler systems provide sufficient precursor delivery rates unless it is desired to form larger area platinum films with continuous coverage of surfaces of various geometries, it would have been obvious to have used conventional bubblers for delivery

of the precursors for applications other than that listed by Baum et al. as being inadequate given the expectation of such delivery system being adequate for these applications.

Baum et al. are silent as to the deposition times and Pt film thicknesses. However, these parameters are clearly directly related and the thickness is a function of the intended purpose. Therefore, adjustment of these result effective parameters through routine experimentation for optimization would have been obvious, absent evidence showing the criticality of using the claimed values.

With respect to claims requiring certain ratios of oxygen to nitrous oxide, Baum et al. disclose that the purpose of the oxidizing gas is to remove carbon facilitate DRAM production (col. 5, lines 27-47) and the relative amounts of the oxidizing gases in the process would affect this result. As such, variation of this result effective parameter through routine experimentation, including to values in the claimed range, for optimization would have been obvious absent evidence showing the criticality of using the claimed values.

Please note that Baum et al. explicitly disclose at col. 7, lines 40-45 that suitable "chemical vapor deposition conditions" for the platinum deposition "may readily be determined without undue experimentation by those of ordinary skill in the art". These "chemical vapor deposition conditions" would clearly include the reaction pressure, flow rates of reactants and carrier gases, deposition times, ratios of reactants to each other and to carrier gases, etc. The examiner maintains, as set forth above, and as explicitly stated by Baum et al. that these conditions are readily determined through routine experimentation for optimization. Therefore, using values within the claimed ranges for these conditions would have been prima facie obvious in the absence of evidence which shows a criticality for using the claimed values.

Claims 61-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum et al. (5,783,716) in view of Kwon et al.

Baum et al. disclose a process for depositing platinum films comprising providing a precursor such as methylcyclopentadienyl trimethylplatinum to a chamber containing a substrate, along with an oxidizing gas, such as oxygen and nitrous oxide mixtures, and depositing the platinum film on a substrate at 200-300 C, said platinum film being useful for an electrode for DRAM (Example 6). The claimed substrates are disclosed at col. 7, lines 52-63.

Baum et al. are silent as to the flow rate at which the oxygen/nitrous oxide gas is delivered to the chamber. However, because this flow rate affects the amount of oxidizing gas mixture provided to the chamber for removal of carbon impurities and would also depend on the amount and type of platinum precursor delivered, deposition rate, etc. which factors determine how much carbon is present, the total flow rate of oxidizing gases to the chamber is a result effective parameter and it would have been a matter of routine experimentation to determine appropriate amounts (flow rates) of the oxidizing gases to provide to optimize removal of carbon from the film.

Baum et al. disclose that higher precursor delivery rates are achieved when delivering the precursor by direct liquid injection rather than by using conventional bubbler systems which involve delivering the precursor by bubbling a non-reactive gas therethrough. However, because Baum et al. disclose at col. 1, lines 40-68 that conventional bubbler systems provide sufficient precursor delivery rates unless it is desired to form larger area platinum films with continuous coverage of surfaces of various geometries, and because Kwon et al. disclose that using a bubbler with argon inert carrier gas to deliver the same platinum precursor as that used by Baum

et al. is effective for depositing a platinum film for an electrode of a memory cell (abstract; experimental), it would have been obvious to use a bubbler to deliver the precursor of Example 6 of Baum et al. for forming an electrode for a memory cell because doing so would have been expected to be effective.

The other differences with respect to result effective parameters are obvious for the reasons set forth in the rejection above.

Claims 1-4, 6-10, 12-36, and 46-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum et al. (5,783,716) in view of Kwon et al. and Chen et al. (Applied Physics Letters).

Baum et al. disclose a process for depositing platinum films comprising providing a precursor such as methylcyclopentadienyl trimethylplatinum to a chamber containing a substrate, along with an oxidizing gas, such as oxygen and nitrous oxide mixtures, and depositing the platinum film on a substrate at 200-300 C, said platinum film being useful for an electrode for DRAM (Example 6). The claimed substrates are disclosed at col. 7, lines 52-63.

Baum et al. are silent as to the pressure in the deposition chamber during deposition. However, because Baum et al. do not limit the deposition pressure and because Kwon et al. and Chen et al. disclose that deposition pressures of 2 Torr and atmospheric, respectively, are effective deposition pressures for depositing Pt films by CVD using the precursors disclosed by Baum et al. (see Kwon at page 2849 and Chen at page 1591), it would have been obvious to have used deposition pressures in this range (2 Torr to atmospheric (760 Torr)) which overlaps with the claimed ranges because these deposition pressures would have been expected to be effective

for depositing the platinum films by CVD with these precursors, especially in the absence of objective evidence which shows an unexpected result derived from using pressures in the claimed ranges.

Baum et al. are silent as to the flow rate at which the oxygen/nitrous oxide gas is delivered to the chamber. However, because this flow rate affects the amount of oxidizing gas mixture provided to the chamber for removal of carbon impurities and would also depend on the amount and type of platinum precursor delivered, deposition rate, etc. which factors determine how much carbon is present, the total flow rate of oxidizing gases to the chamber is a result effective parameter and it would have been a matter of routine experimentation to determine appropriate amounts (flow rates) of the oxidizing gases to provide to optimize removal of carbon from the film.

With respect to claims 6-36, Baum et al. disclose that higher precursor delivery rates are achieved when delivering the precursor by direct liquid injection rather than by using conventional bubbler systems which involve delivering the precursor by bubbling a non-reactive gas therethrough. However, because Baum et al. disclose at col. 1, lines 40-68 that conventional bubbler systems provide sufficient precursor delivery rates unless it is desired to form larger area platinum films with continuous coverage of surfaces of various geometries, it would have been obvious to have used conventional bubblers for delivery of the precursors for applications other than that listed by Baum et al. as being inadequate given the expectation of such delivery system being adequate for these applications. Alternatively, because Kwon et al. disclose that using a bubbler with argon inert carrier gas to deliver the same platinum precursor as that used by Baum et al. is effective for depositing a platinum film for an electrode of a memory cell (abstract;

experimental), it would have been obvious to use a bubbler to deliver the precursor of Example 6 of Baum et al. for forming an electrode for a memory cell because doing so would have been expected to be effective.

With respect to the claims requiring specified flow rates of inert gases for delivering the precursor, this clearly affects the amount of precursor delivered to the process which affects the deposition rate, etc. Therefore, this is a result effective parameter and adjustment of this result effective parameter through routine experimentation for optimization would have been obvious absent evidence showing the criticality of using the claimed flow rates.

Likewise, Baum et al. are silent as to the deposition times and Pt film thicknesses. However, these parameters are clearly directly related and the thickness is a function of the intended purpose. Therefore, adjustment of these result effective parameters through routine experimentation for optimization would have been obvious, absent evidence showing the criticality of using the claimed values.

With respect to claims requiring certain ratios of oxygen to nitrous oxide, Baum et al. disclose that the purpose of the oxidizing gas is to remove carbon facilitate DRAM production (col. 5, lines 27-47) and the relative amounts of the oxidizing gases in the process would affect this result. As such variation of this result effective parameter through routine experimentation, including to values in the claimed range, for optimization would have been obvious absent evidence showing the criticality of using the claimed values.

Please note that Baum et al. explicitly disclose at col. 7, lines 40-45 that suitable "chemical vapor deposition conditions" for the platinum deposition "may readily be determined without undue experimentation by those of ordinary skill in the art". These "chemical vapor

deposition conditions" would clearly include the reaction pressure, flow rates of reactants and carrier gases, deposition time, ratios of reactants to each other and to carrier gases, etc. The examiner maintains, as set forth above, and as explicitly stated by Baum et al. that these conditions are readily determined through routine experimentation for optimization. Therefore, using values within the claimed ranges for these conditions would have been prima facie obvious in the absence of evidence which shows a criticality for using the claimed values.

(11) Response to Argument

Appellants argue on page 6 of the appeal brief that Baum does not teach or suggest the subject matter of claims 56-68. As set forth in the rejection above, Baum fails to explicitly teach the deposition conditions such as total flow rate of oxygen and nitrous oxide, deposition time and film thickness, deposition pressure, etc. However, as established in the rejection, these parameters are clearly result effective and it would have been within the ordinary level of skill in the CVD art to determine values for these parameters through routine experimentation for optimization. Baum explicitly states as much.

Appellants argue at pages 6-9 of the appeal brief that the total flow rate of oxidizing gases is not a result effective parameter and that the examiner's position is an unsupported assumption. The examiner respectfully disagrees. As set forth in the rejection, the prior art clearly teaches that the purpose of the oxidizing gas mixture is to delete carbon contamination in the film. Given this purpose, it is clear that the amount of such oxidizing gas provided to the process, or more specifically, its flow rate into the chamber, would affect how much carbon is eliminated. The flow rate affects the amount of carbon removed. This is not an unsupported assumption. Appellants appear to argue that there is a criticality for using the claimed flow rates

in that their Examples 1-4 in the specification show that using the claimed flow rates results in coverage up to 69% which is a marked improvement over the prior art. This data, however, falls far short from conclusively showing a criticality for using the claimed flow rate of oxidizing gas. For one thing, the data is not commensurate in scope with the claims. The data only show results for using 1800 sccm which cannot be said to represent the scope of the claimed range. Furthermore, any result obtained by varying one reactant (i.e., oxidizing gas flow) will depend on the amount of the other reactant supplied. It is not clear that the same results would be obtained over the range of any amount of the platinum precursor flow of which the claims are inclusive. Appellant's argument with respect to "dilution" set forth at the paragraphs bridging pages 8-9 is confusing because of this. Appellants appear to argue that the high flow rates are not obvious due to high carrier flow rates. However, no claim describes the flow rate of precursor relative to the oxidizing gases, which is the critical factor for dilution to come into effect. For these reasons, the evidence provided is not sufficient to show a criticality for using the claimed range of flow rates.

Appellants argue at page 11 of the appeal brief that the Baum and Kwon references do not teach or suggest the claim limitations. The examiner holds that every claim limitation is obvious from the prior art for the reasons established in the rejection above. At page 12 of the appeal brief, appellants set forth the position that "Kwon proves that platinum film qualities are not a result of routine experimentation and that platinum deposition parameters, such as deposition temperatures and time, are not "clearly related to thickness" of such platinum films, as the final Office Action unfairly continues to assert. To assert that the knowledge that "the longer one deposits a film, the thicker the film becomes" would be within the level of knowledge of the

ordinary artisan in the CVD art, is not an unfair assertion. One of ordinary skill in the art would clearly be aware of the relationship between amount of time of depositing and how thick the film becomes and therefore would recognize these deposition parameters as result effective.

Appellants argue at pages 13-16 of the appeal brief that there is nothing to indicate that the pressures of the Kwon and Chen references would be appropriate for the Baum deposition chemistry and that the references are not combinable because of the diverse chemistries involved. The deposition chemistry between Kwon, Chen, and Baum is not as diverse as appellants argue. In all three processes, there is decomposition of the same precursors to deposit a platinum film (Baum teaches either $CpPtMe_3$ or $MeCpPtMe_3$ (col. 6, lines 8 and 9), Chen teaches $CpPtMe_3$ (abstract), and Kwon teaches $MeCpPtMe_3$ (abstract). Baum and Kwon both teach to add oxidizing gas to the conventional hydrogen atmosphere used by Chen for the purpose of reducing carbon contaminants contributed by the organic precursors. The Baum reference teaches the same precursors and oxidizing gas as claimed but does not explicitly disclose which pressures are operable but does state that "the platinum is deposited from the platinum source reagent vapor on the substrate, under **suitable chemical vapor deposition conditions such as may readily be determined without undue experimentation by those of ordinary skill in the art**" (Baum at col. 7, lines 33-45, emphasis added). Such "suitable chemical vapor deposition conditions" would clearly include a deposition pressure. As Baum does not provide a pressure, one would be left to review references to find appropriate pressures to use. Such review would clearly yield the secondary references which show deposition of platinum using the same platinum precursors and that such depositions can be performed at a pressure of 2 Torr and a pressure of atmospheric. Given these teachings, one of ordinary skill in

the art would reasonably expect that the platinum deposition with this precursor would be operable over such a range. In the absence of secondary evidence showing a criticality of the claimed pressures, it remains obvious to use the claimed pressures for the reasons set forth above.

Appellants argue at pages 17-19 of the appeal brief that Kwon and Chen do not teach or suggest a range of pressures. Appellants argue that each reference individually does not teach or suggest that pressures other than the one explicitly disclosed in each thereof would be operable. The rejection is based on the teachings of the prior art as a whole and what clearly is encompassed thereby is that platinum films can be deposited using the Baum precursors at 2 Torr and at 760 Torr. The art provides clear evidence that platinum films can be obtained from these precursors using reduced pressures (2 Torr) and atmospheric pressure (760 Torr). Appellant's argument with respect to toluene affecting one's decision of a pressure to use for deposition in the Chen process at page 18 of the appeal brief is baffling. It is assumed that appellants are referring to the disclosure at page 1591, second paragraph, of Chen. This is merely a disclosure of how the platinum precursor was synthesized. It is the platinum precursor that is used in the deposition process. There is no logical reason why the solvent used in the synthesis of the organometallic platinum precursor should have any affect on one's decision of which pressure to sue for the deposition.

Appellant's arguments on pages 19-21 of the appeal brief are moot as this ground of rejection is withdrawn and is therefore no longer an issue under appeal.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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July 11, 2001

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